In re Appln. of Jurczyk et al
Application No. 10/058,561

CLAIM AMENDMENTS

Amendments in the Claims:

Please cancel without prejudice claims 8-27, 45-67, and 78-161.

Listing of Claims:

Claim 1. (previously presented)A method of producing neutrons in a chamber containing an ion source region, an accelerator region and a gas target region, comprising the steps of;

a. generating deuterium ions in the ion source region,
b. accelerating deuterium ions to high-energy by the application of an electric field in the accelerator region,
c. allowing deuterium ions to collide with deuterium gas targets in the gas target region, producing neutron-generating fusion reactions.

Claim 2. (previously presented)The method according to claim 1 wherein the gas targets are replenishable.

Claim 3. (previously presented)The method according to claim 1 further comprising the step of placing the chamber in an inactive state in which state neutron-generating fusion reactions do not occur.

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Claim 4. (previously presented)The method according to claim 1 wherein the deuterium gas targets comprise a mixture of deuterium and tritium gas for high-energy neutron generation.

Claim 5. (previously presented)The method according to claim 1 wherein the ion source comprises an ion source selected from the group consisting of a Penning ion source, a plasmatron, a duoplasmatron, a radio frequency ion source, a quadrapole ion source, and a discharge ion source.

Claim 6. (previously presented)The method according to claim 1 further comprising the step of minimizing the production and transmission of electrons through the accelerator region.

Claim 7. (previously presented)The method according to claim 6 wherein the step of minimizing the production and transmission of electrons through the accelerator region provides greater neutron generation per unit ion current than that prior to the step of minimizing.

Claims 8-27 (cancelled)

Claim 28. (previously presented)A method of producing neutrons in a chamber containing an anode electrode and a semi-transparent cathode electrode comprising the steps of;

introducing a fusible gas into the vacuum chamber;

creating a voltage differential between the cathode electrode and the anode electrode whereby a high-pressure high-resistance gaseous discharge forms primarily between the anode electrode and at least one semi-transparent surface of the cathode electrode and extends through openings of the semi-transparent cathode into an intra-cathode region defined by at least one surface of the cathode electrode, and whereby ions selected from

the group consisting of deuterium ions and tritium ions of said discharge are accelerated by said voltage differential, with a substantial portion of said ions passing through the openings of the semi-transparent cathode surfaces;

allowing a portion of said ions to undergo charge-exchange collisions with background gas particles to produce fast-neutral particles selected from the group consisting of deuterium particles and tritium particles, whereby a portion of said fast neutral particles pass through the openings of the semi-transparent cathode surfaces, and whereby said high-resistance gaseous discharge is sustained primarily through charged particle generation initiated by the ions and fast neutral particles; and

generating neutrons from said high-pressure high-resistance gaseous discharge predominantly as a product of fusion collisions occurring between said ions and background gas particles and between said fast-neutral particles and background gas particles.

Claim 29. (previously presented)The method according to claim 28 wherein at least a portion of background gas particles that experience collisions with ions or fast-neutral particles are situated on a surface of a material within the vacuum chamber at the time that they experience the collisions.

Claim 30. (previously presented)The method according to claim 29, wherein the portion of background gas particles that are situated on a surface of a material within the vacuum chamber are attached to the surface by chemical adsorption.

Claim 31. (previously presented)The method according to claim 29, wherein the portion of background gas particles that are situated on a surface of a material within the vacuum chamber are attached to the surface by physical adsorption.

Claim 32. (previously presented)The method according to claim 28, wherein the chamber and electrodes have a shape selected to produce neutrons with a spatial distribution dependent on the high-pressure high-resistance discharge volume within the shape.

Claim 33. (previously presented)The method according to claim 28 wherein the chamber further comprises an electron management system to augment neutron production power efficiency of the method by reducing power consumption attributable to electrons generated in the vacuum chamber and conducted through the gaseous discharge.

Claim 34. (previously presented)The method according to claim 33 wherein the electron management system comprises a feature selected from the group consisting of electrode surface treatments and low-secondary electron emission materials to reduce secondary electron formation.

Claim 35. (previously presented)The method according to claim 33 wherein the electron management system provides electric potential repression of the intra-cathode region to reduce secondary electron formation.

Claim 36. (previously presented)The method according to claim 33 wherein the electron management system comprises baffle electrodes to minimize intra-cathode region errant particle and electron paths for minimization of electron generation.

Claim 37. (previously presented)The method according to claim 33 wherein the electron management system comprises the placement of surfaces to promote electron-ion recombination within the intra-cathode region to minimize power losses.

Claim 38. (previously presented)The method according to claim 28 wherein the cathode further comprises at least one non-transparent surface for impeding the movement of gaseous discharge particles.

Claim 39. (previously presented)The method according to claim 28 wherein the at least one semi-transparent surface of the cathode comprises a plurality of openings that are sufficiently large so as to allow passage of ions and fast neutral particles.

Claim 40. (previously presented)The method according to claim 28 wherein the anode electrode is comprised of an inner surface of the vacuum chamber.

Claim 41. (previously presented)The method according to claim 28 wherein the anode electrode comprises openings and is semi-transparent to nuclear and atomic particles.

Claim 42. (previously presented)The method according to claim 28 wherein the chamber further comprises a gas pressure storage and regulation mechanism for storing at least a portion of the deuterium gas and for regulating a pressure of the deuterium gas in the vacuum chamber.

Claim 43. (previously presented)The method according to claim 28 further comprising the step of storing at least a portion of the deuterium gas and regulating a pressure of the deuterium gas using a getter material.

Claim 44. (previously presented)The method according to claim 28 wherein the chamber further comprises a heat removal mechanism for preventing heat damage to the chamber.

Claims 45-67 (cancelled)

Claim 68. (previously presented)A method of producing neutrons in a chamber containing an anode electrode, a semi-transparent suppressor cathode electrode and a semi-transparent leeching cathode comprising the steps of;

introducing a fusible-gas into the vacuum chamber;

creating a voltage differential between the cathode electrodes and the anode electrode, and applying a high-voltage to the leeching cathode, and a bias voltage to the suppressor electrode relative to the leeching cathode, whereby a high-pressure high-resistance gaseous discharge forms primarily between the anode and semi-transparent suppressor surfaces and extends through the openings of the semi-transparent suppressor electrode surfaces, passing through the suppressor and leeching electrodes and an intra-cathode

region defined by at least one surface of the cathode electrode, and whereby ions selected from the group consisting of deuterium ions and tritium ions of said gaseous discharge are accelerated by the voltage differential, with a substantial portion of said ions passing through the openings of the semi-transparent cathode surfaces;

allowing a portion of said ions to undergo charge-exchange collisions with background gas particles to produce fast-neutral particles selected from the group consisting of deuterium particles and tritium particles, whereby a portion of said fast-neutral particles pass through the openings of the semi-transparent cathode surfaces, and whereby said high-pressure high-resistance gaseous discharge is sustained primarily through charged particle generation initiated by the ions and fast neutral particles; and

generating neutrons from said high-pressure high-resistance gaseous discharge as a product of fusion collisions occurring between said ions and background gas particles and between said fast-neutral particles and background gas particles.

Claim 69. (previously presented)The method according to claim 68 wherein at least a portion of background gas particles that experience collisions with ions or fast-neutral particles are situated on a surface of a material within the vacuum chamber at the time that they experience the collisions. IBd

IBa IBc Claim 70. (previously presented)The method according to claim 69, wherein the portion of background gas particles that are situated on a surface of a material within the vacuum chamber are attached to the surface by chemical adsorption.

Claim 71. (previously presented)The method according to claim 69, wherein the portion of background gas particles that are situated on a surface of a material within the vacuum chamber are attached to the surface by physical adsorption. IBd

Claim 72. (previously presented)The method according to claim 68, wherein the chamber and electrodes have a shape selected to produce neutrons with a spatial distribution dependent on the high-pressure high-resistance discharge volume within the shape. IBg (FIG 10a)

Claim 73. (previously presented)The method according to claim 68, further comprising the step of employing an electron management system to augment the neutron production power efficiency of the method through the reduction of power consumed by the production or conduction of electrons through the gaseous discharge. IBo

IBm Claim 74. (previously presented)The method according to claim 73 wherein the electron management system comprises a feature selected from the set consisting of electrode surface treatments and the use of low secondary electron emission materials to reduce secondary electron formation.

IBn Claim 75. (previously presented)The method according to claim 73 wherein the electron management system provides electric potential repression of the intra-cathode region to reduce secondary electron formation.

Claim 76. (previously presented)The method according to claim 73 wherein the electron management system comprises baffle electrodes to minimize intra-cathode region errant particle and electron paths for minimization of electron generation. IB0

IBP Claim ~~77~~. (previously presented)The method according to claim 73 wherein the electron management system comprises the placement of surfaces to promote electron-ion recombination within the intra-cathode region to minimize power losses.

Claims 78-161 (cancelled)

Paragraph 1:

Applicants will timely request correction of any errors in the specification that they become aware of. Applicants are not currently aware of any errors.

Paragraph 2:

In response to the objection to the specification as having font that is of too small a size, Applicants herewith submit a substitute specification having an increased font size. The substitute specification is attached at the Appendix. No new matter is added in the substitute specification, and no changes are made in the substitute specification other than to add paragraph numbers. Because there are no changes to the contents of the specification, no marked up copy is submitted.

Paragraph 3:

In response to the restriction requirement of paragraph 3, Applicants elect, with traverse, category I, including claims 1-7, 28-44, and 68-77.

Although the Office action states that the process claims of group I can be practiced by other means than the apparatus claimed in group II "such as neutron generation system employing a ***solid target***," it is clear from the language of, for example, claim 1 that it expressly recites and requires a gas target.

Paragraph 9:

In response to the election of species requirement of paragraph 9, Applicants elect, with traverse, species IB, including claims 68-77.

Paragraph 18:

In response to the election of species requirement of paragraph 18, Applicants provisionally elect, with traverse, species IBd, currently including no claims. Applicants traverse the election of species requirement on the basis that, inter alia, there are no claims pending in species IB that match the description of species IBd.

If any claim is deemed to be within the relevant subcategory, then applicants are provisionally electing that claim(s).

Paragraph 19:

In response to the election of species requirement of paragraph 19, Applicants provisionally elect, with traverse, species IBo, currently including no claims. Applicants traverse the election of species requirement on the basis that, inter alia, there are no claims pending in species IBd that match the description of species IBo.

If any claim is deemed to be within the relevant subcategory, then applicants are provisionally electing that claim(s).

Paragraph 20:

In response to the election of species requirement of paragraph 20, Applicants provisionally elect, with traverse, species IBq, currently including no claims. Applicants traverse the election of species requirement on the basis that, inter alia, there are no claims pending in species IBo that match the description of species IBq.

If any claim is deemed to be within the relevant subcategory, then applicants are provisionally electing that claim(s).

Paragraph 21:

In response to the election of species requirement of paragraph 21, Applicants provisionally elect, with traverse, species IBv, currently including no claims. Applicants traverse the election of species requirement on the basis that, inter alia, there are no claims pending in species IBq that match the description of species IBv.

If any claim is deemed to be within the relevant subcategory, then applicants are provisionally electing that claim(s).

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

Phillip Pippenger, Reg. No. 46,055
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson
Chicago, Illinois 60601-6780
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

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